THE
HARMONY
BORAX WORKS
OF
DEATH VALLEY, CALIFORNIA

BY

DEAN LEMON

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ON THE COVER: The Twenty-Mule Team at Harmony Borax Works, 1937.
Photo courtesy of U.S. Borax, Inc. archives and Frasher Fotos

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Bob Tanner's 20-Mule Team and U.S. Borax, Inc. Wagons
at Harmony Borax Works during the 1999 Encampment.
Photo by Bob Greenburg

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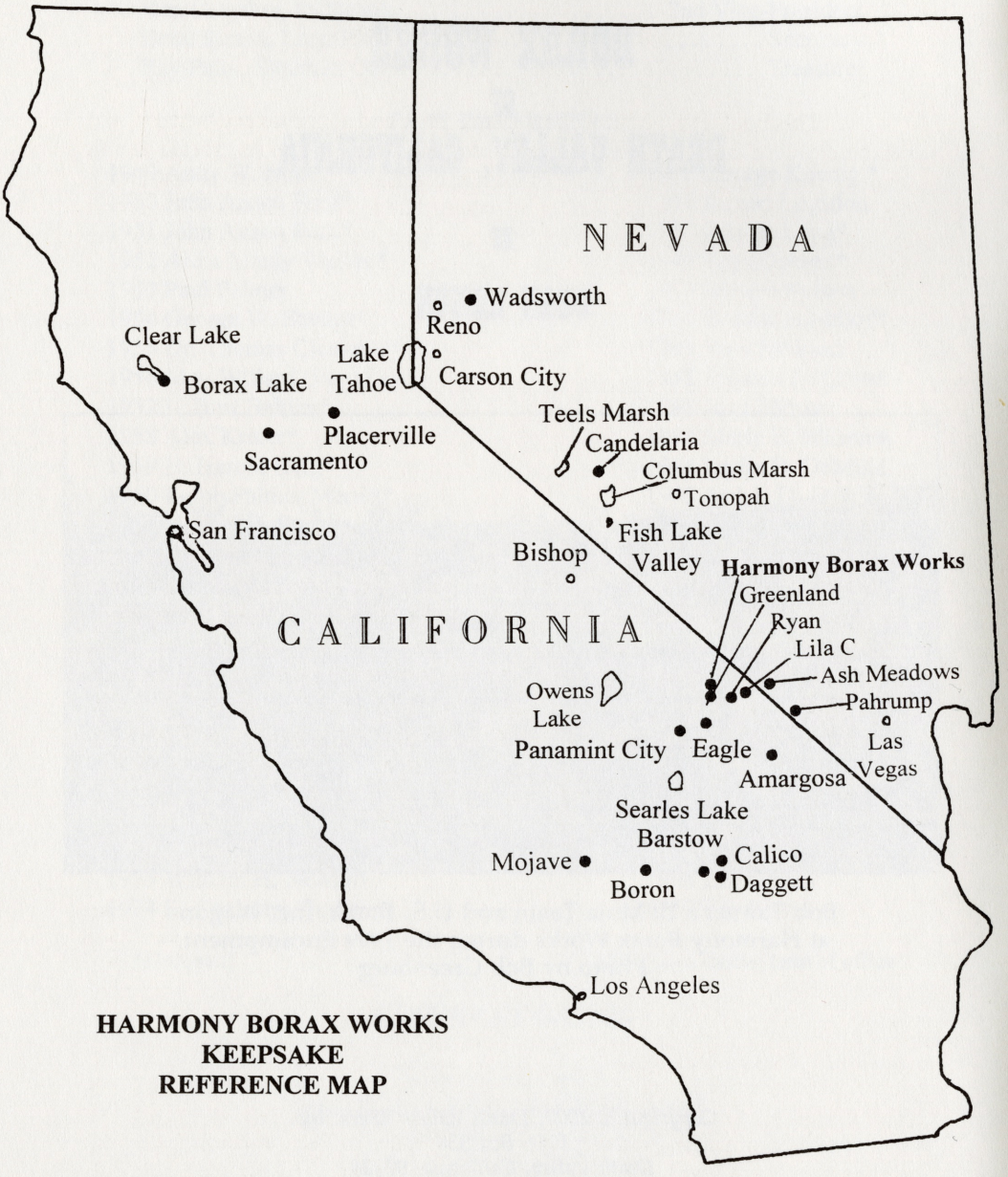


HARMONY BORAX WORKS
KEEPSAKE
REFERENCE MAP

HARMONY BORAX WORKS

This booklet is about a borax plant, large and sophisticated when it was constructed but small by today's standards, and built in remote, scenic Death Valley. It is because of this small enterprise that the stories of borax and Death Valley have become legends and so intertwined as to be inseparable. How and by whom was the plant built, why was it called Harmony and how has the legend linking borax and Death Valley been perpetuated ?

About Borax

Borax has been an item of commerce for centuries, and unsubstantiated history has it being used by ancient Babylonians and Egyptians as early as 2000 BC, for working precious metals, for medicine and even mummification. The first recorded use, mostly medicinal, was by Arabian chemists in the eighth century AD. Although the tale that Marco Polo brought it to Venice from China is apparently without foundation, the Venetians did establish a borax monopoly in the 14th century and used it in their working of precious metals. European trade in borax was well established by the 1600s and the Dutch had taken over the monopoly. Tibet was the principal source of borax in these early times, making the substance both hard to obtain and expensive and limiting its use to the very few trades, such as jewelry making, that could afford it. By the mid-1800s French and English companies were producing borax and sources had been discovered in Italy replacing Tibet as the primary supplier. The principal uses of borax at that time were for the refining and working of precious metals, for enamel coverings of metal ware, in porcelain glazes and to some extent in the making of glass.

"The Tincal Trail" by Travis and Cocks (see bibliography) is the source for much of the above and following historical information. The book contains an authoritative, readable and much more extensive account of these facts than can be included here.

Borax in the United States

Borax was discovered in the United States in 1856 when Dr. John Veatch found it in hot springs in Northern California. He developed the first commercial production of borax in the United States in 1864 at Borax Lake near the south end of Clear Lake, also in Northern California. This source lasted only five years, and because borax was selling at fifty cents a pound and being imported at a rate of some $200,000 worth per year, there was considerable interest in finding other sources.

In 1871 a sodium–calcium borate, named "ulexite" after the German chemist who first identified it, was found by William Troup at Columbus Marsh in Nevada and the "borax rush" was on. This form of ulexite was nicknamed "cottonball" because it occurs in nodules covered with white fibrous crystals (see page 11). The marsh was soon covered with mining claims and it is reported that at one time there were nineteen operators attempting to produce borax there. It is here that we first meet the principal characters later to be involved in Death Valley and the Harmony Borax Works.

This seems to be a good place to interject an aside to say that there are displays of cottonball nodules and other borate minerals, as well as descriptions of the uses and history of borax, at the Death Valley Museum at the Park Service Visitor Center. There is also a beautiful display of borates and other minerals at the Borax Museum at Furnace Creek Ranch and U. S. Borax Inc. has a very interesting exhibit on borates and the history and uses of borax at the visitor center overlooking the plant and mine at Boron.

Harmony's Principal Characters, Smith and Coleman

F. M. Smith was a Wisconsin farm boy who came west in 1867 when he was 21 years old. For five years he roamed the mining camps of Montana, Nevada and California sometimes mining and sometimes doing other things including operating restaurants. In 1871 he applied for a job at a small borax refinery in San Francisco and was offered a contract to supply firewood for the company's operation at Columbus Marsh. He accepted and moved to a wooded area atop the mountains near Columbus and Candelaria, Nevada, where he built a cabin and set up shop. From his cabin he could see Columbus Marsh to the south and also another dry lake, Teels Marsh, to the northwest.

Curiosity took him to Teels where he collected some samples which, when assayed, proved to be the "finest specimen of borate of soda" found up to that time. He and his woodcutters staked mining claims over most of the lake, but on attempting to file, found them to be invalid because of claim size restrictions imposed by the new Mining Law of 1872. They hurried to re-stake the lake with smaller claims but ran out of names to use and resorted to using names of Wisconsin friends who had never seen Nevada, much less Teels Marsh. He later surprised these friends by buying their claims from them for a dollar each.

When the rush died down there were many other claimants on the marsh but Smith had acquired the best deposits and in 1873 he and his brother Julius had started production as Smith Brothers Borax Co. To market their product they turned to William T. Coleman & Co., a large San Francisco commission house that had previously marketed borax for Dr. Veatch and some

of the early Columbus Marsh producers. This started a relationship that was to last through the Death Valley years.

William T. Coleman

F. M. "Borax" Smith

Photos from U. S. Borax Inc. archives

William Tell Coleman was born in Kentucky in 1824. He was orphaned at 8, raised by grandparents, became self-supporting and left home at 15 to become a surveyor. He entered college at 18 and completed the 4-year course in 2 years after which he supervised a plantation in Louisiana and a lumbering operation in Wisconsin. He and a brother organized a party that left St. Louis for California in 1849 arriving in Sacramento in August. Soon realizing the odds against success in mining, he opened stores selling miner's supplies in Sacramento and later in Hangtown, now Placerville.

In 1850 he moved to San Francisco and established W. T. Coleman and Co., a commission house. He was very successful in introducing California products to east coast markets and was instrumental in establishing the California raisin industry. At one time his company owned or chartered 17 clipper ships in world wide trade out of San Francisco.

In 1851 a group of criminal toughs from Australia were terrorizing the city and Coleman joined other citizens to form a vigilante committee that brought them under control. In 1856 he helped form another committee, this time becoming its president, to take control of city law enforcement from corrupt city and county officials. And finally, in 1877 he was again elected to chair a committee, organized at the request of city officials, to counteract the threat of mob violence by underpaid and unemployed white workers protesting capitalism and the use of Chinese labor.

Over the years he established such a reputation for integrity and good work that he was strongly urged to accept, but declined, the Democratic Party nomination for President of the United States

Borax Production Comes to Death Valley

In its May 10th 1873 issue, the *Inyo Independent* stated that extensive deposits of borax had been found in two or three locations in Death Valley but the paper noted that development was unlikely because of poor ore grade, remote location and severe climate, which is explanation enough as to why there was no borax rush in Death Valley at that time.

Also in 1873 John Searles, a California prospector and grizzly bear hunter, hearing of Smith's success at Teels Marsh, obtained samples from what was to become Searles Lake, had them analyzed and started another borax rush. He was restricted, as Smith had been, to 20-acre claims but managed to stake most of the valuable borax areas and started producing borax as the San Bernardino Borax Mining Co. His competitors at Searles Lake were not successful and he was soon the sole operator there.

In 1880 Isadore Daunet, a survivor of an ill fated attempt to cross Death Valley in the summer of 1875, remembered having seen cottonball at some point during his ordeal. He and three partners formed the Eagle Borax Company, hauled some equipment from San Bernardino and set up the Eagle Borax Works where they had found good samples near Bennetts Well. They produced borax from late 1882 to the spring of 1884. Their plant and process were quite crude; they boiled cottonball in a rectangular tank 22' x 5' x 3' deep, which was set on a stone foundation, and under which they burned a mesquite fire. The hot solutions were drained to twelve 1,000-gallon cylindrical vats where the borax crystallized as the solutions cooled. This took about ten days, depending on the weather, after which the crystallized borax was removed, bagged and shipped by mule team and wagon to the railroad at Daggett They shut the operation down for three months in summer because the solutions would not cool sufficiently to allow the borax to crystallize and because of impossible living and working conditions at their plant site. The enterprise ended when Daunet committed suicide in San Francisco in 1884, driven to do so by a combination of financial and marital troubles.

And Now Harmony

The story of Harmony Borax Works begins in 1880 with Aaron Winters and the often told "She burns green !" anecdote. Most of what we know about this incident comes from John Spears' book (see bibliography).

Spears describes Winters as a "white Arab" (desert rat in today's vocabulary) "in every way a rugged frontiersman" who "was slow of speech, somewhat reserved and unapproachable in manner, but a hearty, square man, bluff, brave, and generous". In view of the outcome of this story, he could have added "shrewd"!

Rosie, Winters' wife, is described as "a comely, delicate Spanish-American woman with frail health" and their house in Ash Meadows is described as two fifteen foot square rooms with dirt floors, partially hewn out of a rock embankment and partially canvas covered, with very crude amenities. The further descriptions of their living conditions are too lengthy and detailed to repeat here but they all add up to the fact that living conditions for the Winters were minimal or worse and that Rosie had only memories of better days.

One evening a man whom Spears identifies as an itinerant prospector but who is identified by both Travis and Hildebrand (see bibliography) as Harry Spiller, apparently an employee of Smith or Coleman at the borax works in Nevada, stopped by. In the course of their conversation he told Winters about the Nevada borate deposits, the value of such a deposit, how to test chemically for the presence of borate and also gave him Coleman's name as a person who would be interested in acquiring borate property should he find any.

The field test for borates is quite easy to perform. Some of the pulverized sample is placed in a dish and sulfuric acid added to dissolve the borates. Methyl alcohol is then added and when ignited the mixture burns with a distinctive green flame. The test is best performed after dark or at least out of direct sunlight as the flame is hard to see in bright light.

Spears then says that, after the guest left, Aaron and Rosie left for Death Valley where Aaron had seen material answering Spiller's description of cottonball. They camped near the mouth of Furnace Creek, probably at a site that later became known as Camp Winters, collected some samples and waited for dark. The event deserves all the drama of Spear's writing so let's quote from him:

> "At last the sun went down and the flaming colors in the western sky faded and darkened until the shadows in the gorge of the Funeral Mountains where Winters was camped became absolutely black. By the faint glow of a few dying coals Winters and wife sat down on the sand, put a saucer of the material on a rock between them, poured the chemicals and alcohol over it and then Winters scratched a match to fire the mixture. How would it burn? For years they had lived as the Piutes live on the desert. Not only had the wife to do without the little luxuries and comforts dear to a woman's heart, they

had both lived on mesquite beans and chahwallas (sic) when the flour and bacon were gone —they had even gone hungry for lack of either. Would the match change all that? Winters held the blaze to the mixture in the saucer with a trembling hand and then shouted at the top of his voice: 'She burns green, Rosie! We're rich, by ____' ."

Compare Spears' reluctance to use the word "God" with some of the language we see in literature today!!

Winters sent samples of his cottonball to San Francisco to the attention of Mr. Coleman who, according to Hildebrand (see bibliography) sent them to Smith for an opinion. In a few weeks a couple of representatives of those two gentlemen showed up in Ash Meadows expressing interest in Winters' borax deposit. Winters had not filed any mining claims so really had nothing to sell but the knowledge of where he had collected his samples. The two representatives were William Robertson, Coleman's son-in-law, and Rudolph Neuschwander who was superintendent of the borax plant at Fish Lake Valley. Apparently Smith and Coleman were very much impressed by Winters' samples and had given the representatives strong orders to buy because they finally settled on $20,000, a tremendous sum of money in those days, as the price for disclosing the secret of the location. Why so much interest after none had been shown in Death Valley in 1873 ? We can only surmise several things: (1) The samples had shown an impressively high grade of borate, (2) The buyers did not know they were getting into Death Valley until after the deal was made and (3) The Carson and Colorado Railroad was just about to reach Candelaria, Columbus and Teels Marsh and was projected to go to the Colorado River by a route that would have taken it near Ash Meadows, the presumed site of the deposit, making the region much less remote.

When the borax had been located the buyers began staking claims using names of everyone involved, including both Smith and Coleman. They then began making plans for the processing plant, only to find that Winters had obtained water rights to all the available water sources and that they would have to pay him an additional $2,500 to acquire them.

A little later Winters represented two prospectors who had discovered the borate deposit near Shoshone that later became the Amargosa Borax works, and sold that location to the Coleman interests for $15,000 which he and the prospectors split, getting $5,000 each. Winters must have had a very charismatic personality because he and the Coleman people remained on good terms. In fact, on November 21st, 1881 when they formed the "Death Valley Borax and Salt Mining District" to officially record their claims, Winters was elected "recorder", a job that paid him $7.50 for each claim he recorded. Since the district was 15 miles square and claims were limited to 20 acres each, the

potential earnings of this job were impressive. Minutes, dated February 21st 1882, of a mining district meeting called by Winters to tender his resignation as recorder and held at "Camp Winters" "about three-fourths of a mile from the mouth of Furnace Creek", indicate that Wm. Robertson conducted the meeting, that R. Neuschwander was elected to replace Winters as recorder and that one of the miners attending was signed as U(?) B. Spiller, probably Harry. Some time later Winters and Rosie moved to a Pahrump Valley ranch that he had purchased from Charles Bennett with his sales proceeds. Spears says that Rosie died in two or three years and that the ranch was never very successful.

The Harmonious Relationship

The exact nature of the relationship between Coleman and Smith in Death Valley poses a question that may never be fully answered. Hanks (see bibliography), who was there in 1883 in official capacity as state mineralogist, thought they were partners as did Spears who was there in 1892 and interviewed Smith at length. Travis (see bibliography) says there is no record of any formal partnership or direct company link between the two. Hildebrand, who had access to the Smith family records and therefore is giving us Smith's interpretation of the relationship, says that the ownership was definitely Coleman's but that there was a high degree of involvement by Smith in the decision to buy the Death Valley rights from Winters and in the decision-making and planning for Harmony.

Their first relationship, as noted earlier, was as producer and sales agent when Smith Brothers began production at Teels Marsh and needed someone with marketing connections and expertise to sell their product.

Early on, Smith demonstrated the business technique that was to be his modus operandi for the rest of his career: eliminating competition by buying it out. He bought out over 100 other claim locaters at Teels Marsh and to do so borrowed significant sums of money from Coleman at least twice.

The essence of the relationship may be in the fact that Coleman sent Winters' samples to Smith for his opinion and that Smith advised him to buy. Smith seemed to want to eliminate competition elsewhere but in this case favored it. He must have had some assurance of a cooperative relationship and, in fact, in 1887 he and Coleman were instrumental in forming the "San Francisco Borax Board", an association of the five principal borax producers, formed to set a production quota for each producer and to control prices. That maneuver was, incidentally, one of the situations that brought about passage of the Sherman Anti-Trust Act in 1890.

Although Coleman soon acquired ownership of the Death Valley Borax and Salt Mining District claims, Smith's name as well as Coleman, Robertson, Neuschwander and others appear on many of the original claim filings.

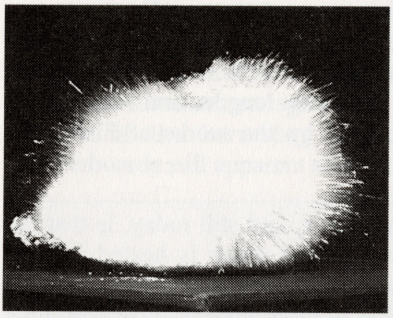
The building now being used as the Borax Museum at Furnace Creek Ranch is reported to have been built by Smith in 1883 in Twenty Mule Team Canyon as an assay office and bunk house for prospectors. There is also a buggy at the museum said to have been used by Smith for his travels around the area in the 1880s.

And finally, while Coleman was the sole owner of the Death Valley properties, Smith was very much involved in the planning and decision-making and because of this harmonious relationship they chose to call the plant "Harmony".

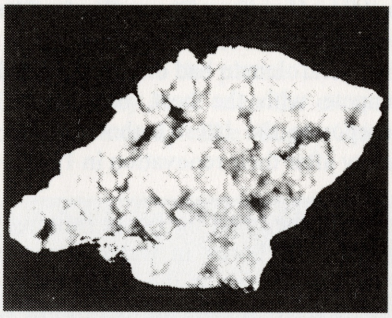
Construction Years 1881 to 1883

Coleman's people knew from their own experience elsewhere and from the experience of the people at Eagle Borax Works that it would be very difficult, if not impossible, to produce borax at Harmony in the summer. This was because of the high temperatures that would impede the crystallization of the borax and make impossible working conditions for the crews. They probably welcomed Winters' offer of the borax claims at Amargosa as the solution to their problem of year round production and the project was quickly organized and carried out under the name of the Meridian Borax Company. We have no notes on the process at Amargosa but the plant was probably smaller and less complex than Harmony because they were able to speed construction and put the plant into production in the summer of 1883, several months before they started production at Harmony. They contracted with a Pahrump Valley rancher named Charles Bennett to haul their product to the railhead at Daggett.

The most important event to take place during these early years, even more so than the construction of the two borax plants, must have been the discovery of colemanite. It would be expected that people working at the mouth of Furnace Creek would do some exploring in their time off to see the sights of this exotic place and in October of 1882 Rudolph Neuschwander, while hiking up Furnace Creek, found an outcropping of clear, glass-like crystals which on analysis turned out to be borate of lime or calcium borate in a form not previously seen. Not surprisingly, they called the new mineral "**colemanite**".



"Cottonball"



"Colemanite"

Photographs from U. S. Borax inc. archives

Other outcroppings were found nearby, including Monte Blanco, which is a sizeable hill of colemanite and is located in Twenty Mule Team Canyon looking now much as it did when it was discovered. They could not use this new mineral, as it is more difficult to process than ulexite and they had yet to develop a process for it. However, they did not lose any time getting organized to file mining claims on the discovery and on November 20 held a meeting to establish the Monte Blanco Borax and Salt Mining District. The new district joined the Death Valley District on its eastern border but extended south an additional 15 miles, making it 30 miles long. Both districts were 15 miles wide east to west. Other discoveries of colemanite soon followed and it was not long before Hugh Stevens, a prospector in the silver district at Calico, near Daggett, found colemanite there and William Robertson was again sent to acquire those claims for the Coleman interests.

The significance of the colemanite discoveries is that, after the process to convert colemanite to borax was developed, they made previous sources obsolete and caused the closing of the marsh borate operations within a few years. The colemanite deposits became the primary source of borax in the United States from 1890 until 1927. Harmony was closed permanently in 1888. In 1890 the company was purchased by Smith who moved the operation to the colemanite deposit near Calico, calling the mine Borate. They operated there until 1907 when they moved back to the Death Valley colemanite deposits and opened the Lila C mine, named after Coleman's daughter Lila. In 1914-15 the mining operation was transferred to the present site of Ryan and in 1927 the Death Valley colemanite mines were closed in favor of the more easily processed sodium borate ores at Boron.

Building Harmony Borax Works-The Process

Coleman had obviously decided that the product from Harmony should compete with the best, because he went to some lengths and expense to incorporate the latest technology as exemplified by the works at Fish Lake Valley after their renovation in 1882

The basis for borax refining processes then, and still today, is that the solubility of borax in water increases rapidly as the water is heated and, of course, decreases as the water cools causing the formation of new crystals of borax. If, as is the case with most ores, there is sand, clay or other insoluble material present, it can be allowed to settle out of the hot solutions so that when the solutions cool and new crystals form, they are free of those impurities. How free they are depends on how well the insoluble material settles, as some of the finer insolubles tend to stay in suspension.

In the case of ulexite, which is a sodium-calcium borate, the calcium related portion tends not to dissolve and is lost with the other insolubles. To overcome this problem some of the marsh borax producers added sodium carbonate in a form called trona at the rate of about 500 pounds of trona to each ton of ulexite. This produced a chemical exchange in which the sodium transferred to the borate, forming borax (sodium borate) and the calcium transferred to the carbonate, forming lime (calcium carbonate), which precipitates with the sand and mud. Without the trona a large percentage of the borate is lost as borate of lime.

The source of the trona used at Harmony is unknown but thought to be nearby, perhaps near the mouth of Cow Creek, a mile or so away. If not, there were abundant accessible supplies of trona at Searles Lake and at Owens Lake.

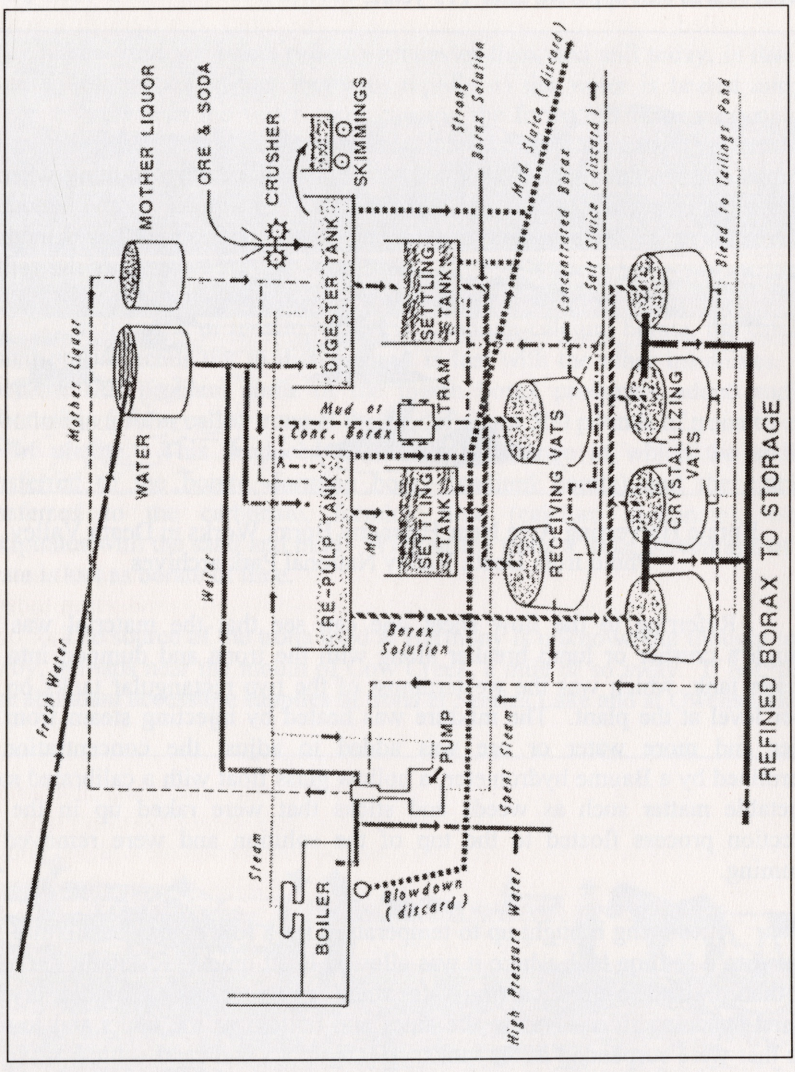
Chinese Laborers Harvesting "Cottonball" in Death Valley, 1885.
Photo Death Valley National Park archives.

At Harmony the cottonball ulexite was scraped by Chinese laborers from the valley floor into piles so that it could drain, then shoveled into carts, transferred to horse drawn wagons and finally brought to the plant. Those who have been fortunate enough to fly over Death Valley have seen the extensive patterns of the harvesting areas, which look exactly like huge Chinese checkerboards still apparent after 115 years.

Borate Harvesting Area Near Harmony Borax Works in Death Valley.
Photo from Death Valley National Park archives

Referring to the flow sheet one can see that the material was fed through a crusher or lump breaker along with the trona and dumped into the digester tank, which was the westernmost of the two rectangular tanks on the upper level at the plant. The mixture was heated by injecting steam from the boiler and more water or ore was added to adjust the concentration as determined by a Baume hydrometer, a hollow glass float with a calibrated stem. Vegetable matter such as weeds and sticks that were raked up in the ore collection process floated to the top of the solution and were removed by skimming.

After being brought up to temperature for a few hours the mixture was drained to a settling tank where it was allowed to sit quietly for about ten hours and then drained to the receiving vats where, as the solutions cooled, crystals formed attaching themselves to the sides and bottom of the tanks and to steel rods that were suspended in the tanks. Heavy rocks and sand settled out in the digester and were shoveled out after the solutions were drained off. Finer silt and clay settled out in the settling tanks and was shoveled from there after the tanks were drained, but some of the very fine silt and also dissolved salt still went with the solutions to the receiving vats and some of it was included in the crystals. This product was called concentrated borax because it still contained small amounts of those contaminants.



Flow chart of the Borax concentration process used at Harmony Borax Works

The concentrated borax was broken from the tank sides and bottoms and in some cases the concentrated borax was shipped as such. In most cases it was hauled by the tram back to the upper level and put into the eastern digester, which is noted on the flow sheet as the re-pulp tank. This digester has a framework of pipes on top of it, apparently for the purpose of suspending the crystal-covered steel rods in the hot water. Here the borax was re dissolved, a process called re-pulping (hence the name of the tank), run through a settling tank and into the crystallizing vats where it again crystallized on the tank sides and bottoms and on the suspended rods, this time with fewer impurities, and it was now called refined borax.

The refined borax was taken to the drying-packing building where it was broken up, allowed to dry, sacked and shipped to Mojave via the famous 20 mule team. From evidence found along the road it appears that they sometimes shipped orders of raw cottonball or concentrated borax as well as the refined borax, undoubtedly at the order of the customer.

To acknowledge an excellent piece of work, the process information above comes from the paper presented by Vincent Morgan at the Second Conference on History and Prehistory held in Death Valley in January of 1988. This paper is noted in the bibliography.

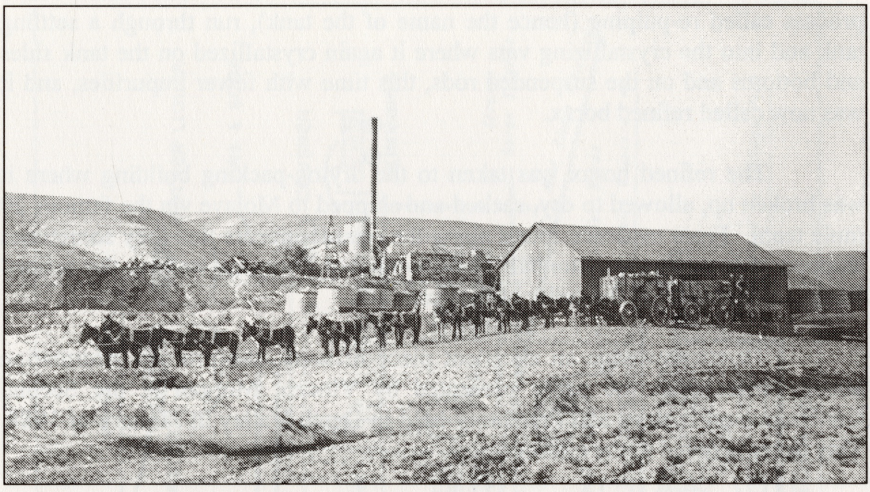
Harmony operated for nine months a year for five years beginning with the fall of 1883 and ending with the summer shutdown in 1888. Their production capacity was about 1,250 tons per year or a little over 6,000 tons for the life of the operation. This would be less than two days production today at the Boron plant but at that time it was nearly one-third of all the borax being produced in the United States.

The Construction

All the equipment and materials for the plant and camp at Harmony including the boiler, two large digesting tanks, eight smaller settling tanks, 57 crystallizing vats, pumps and piping as well as lumber for the offices, housing and boarding facilities, sheds and barns had to be hauled to Death Valley by mule team. Spears says it was hauled 250 miles from San Bernardino. Some items, including the boiler, were made in San Francisco and it seems they might have come by rail to some closer point but, in any case, it was a Herculean effort and expensive at $160 per ton.

Over three miles of water line was laid from Texas Spring and the cut sandstone and cobble walls that we see today were erected to form the four levels on which the plant was built. Piping was installed to handle steam, water and the borax solutions and wooden sluices were built to carry mud and

contaminated solutions to the two evaporating ponds that are still visible below and to the north of the plant. A large drying and sacking shed was built also below and north of the plant and is prominent in many contemporary pictures, including the familiar one of the mule team with loaded wagons that give credence to the statement that there were 18 and not 20 mules in a team.



18 Mule Team and Wagons being loaded at Harmony Borax Works
Photo from Death Valley National Park archives.

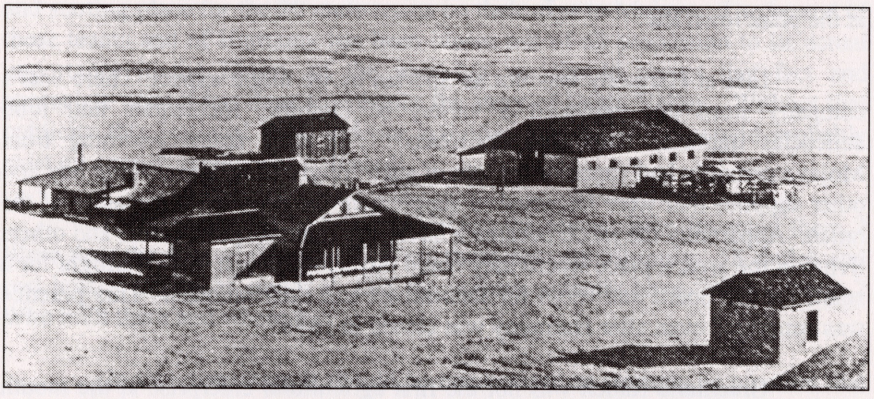
Photos show that they built a road circling the plant so that loaded wagons of ore would be traveling from east to west when they passed above the digester tanks to unload. There was an area where the skimmings were deposited just west of the plant, next to the road, and another area east of the plant where the firewood was unloaded and stored. There was also a dugout structure to the east of the plant that has been filled in temporarily to keep it from collapsing. None of the authors has conjectured as to its purpose but old time borax employees have noted its similarity to structures built at other plants for night shift workers who needed a cool place to sleep in the daytime.

The Camp

Most of what we know about the plant and the town site at Harmony is the result of work done by National Park Service historians and archeologists and recorded in the three excellent archeological and historical reports listed in the bibliography. All the following information concerning the town site and living conditions at Harmony comes from these reports.

There were generally about 40 employees at Harmony, some 30 of whom were Chinese. Various skills were represented and pay rates varied accordingly. All were exceedingly low by today's standards. Blacksmiths were at the high end of the scale at $5 per day and laborers at the low end at $1.25 per day. In between were teamsters (the ones who worked at the plant and hauled the ore and firewood) at $3.25, swampers (teamster's assistants) at $1.95, boilermen at $3.25, cooks at $50.00 per month and clerks at $125 per month. The 20 Mule Team teamsters were paid $150 a month and their swampers $75. It is reported that, for their $1.25 per day, the Chinese worked 70-hour weeks, which translates to 10 hours a day every day. But then what else was there to do? An interesting story in this regard, (Travis p. 63) having nothing to do with Harmony but occurring a few years later at Calico, has the miners going on strike when ordered to take Sunday off. There was nothing else to do and they would lose a day's pay so they all quit work and went to the local bar for a few days until the order was rescinded.

To the north of the plant there are the remains of two adobe structures. The town site was in this area and the living accommodations for the Chinese laborers were between the town site and the plant. From contemporary pictures the archeologists have deduced that there were seven buildings in all. Other than the two adobes they were wooden and have disappeared except for traces.



Town Site at Harmony Borax Works
Photo from Death Valley National Park archives

Thousands of artifacts have been collected, including blacksmith's supplies, buttons, buckles, bottles, porcelain, pipes, nails, cans, cloth, paper, etc., in short, remnants of everything needed to live here and to run the operation. From these collections of artifacts the archeologists have deduced several facts, which are summarized in the following statement from the Teague and Shenk report:

"Buildings at Harmony were associated with laborer's quarters and dining facilities, plant business or storage. Only Chinese lived at Harmony; Anglos lived elsewhere, doubtless at Greenland. Buildings in the town sites were used as offices, sheds and for storage. There once were structures in the Chinese quarters area which were used for housing and food preparation for workers."

The Ranch

Coleman quickly recognized the potential of the oasis created by Furnace Creek and he set about creating Greenland (now Furnace Creek) Ranch to support the borax operation. He quickly sent to Italy for gardeners who came to improve the soil and lay out gardens and irrigation systems. Seeds and seedlings were brought in for vegetable gardens and fruit trees. A half-acre pond was built and some thirty acres planted in alfalfa.

Three men were employed for ranch duties and local Indians helped with the haying and other chores. A large adobe house was constructed and we don't know whether this was the bunkhouse for the Anglo workers from the plant or whether there were other quarters. The ranch supplied fresh meat, fruit, melons and vegetables for the camp commissary, which was also apparently at the ranch, since the archeologists found no evidence of food service for Anglos at the plant town site.

Life at Harmony was not as Spartan as we might expect. There was a company store that provided a variety of clothing, incidentals and food delicacies imported from San Francisco. The mule teams returning from Mojave certainly had capacity for lots of such freight in addition to the hay and other supplies that were imported to supplement the production capacity of the ranch. Apparently the ranch became a haven for itinerant prospectors and others living in the area, a place where they could buy supplies and stay overnight for a small fee for board and room for themselves and their animals. This practice was continued even after Harmony was closed in 1888.

Greenland Ranch was not the first agricultural enterprise at the mouth of Furnace Creek. The earliest ranch we know of was operated in about 1870 by a desert character named "Bellerin Teck" Bennett who raised some alfalfa which he sold to miners at Panamint City. It is reported that he once sold a partnership in his ranch to a Mormon farmer for his oxen and incidentals, including guns. In a few days Teck (or perhaps Tex) ran the disarmed victim off, keeping the oxen and other property. Teck then disappeared from Death Valley history but at least one author has wondered if he is not perhaps the same Charles Bennett who later had a ranch in Pahrump, who contracted to haul borax for Harmony in 1883-84 and who sold his ranch to Aaron Winters for $20,000.

Another interesting group that is mentioned by Spears and that predated Greenland Ranch were the Lee brothers who were descendents of a Mormon family, lived with Indian wives and ran a few cattle on the oasis. Spears reports four of them, named Philander, Leander, Meander and Salamander. "Phi" and "Cub", the first two were later employees of the borax company and figured prominently in the prospecting and filing of the colemanite claims in the upper Furnace Creek region. The other two disappear from the literature, leading one to suspect that they may have been figments of someone's imagination, contrived to take advantage of Spears' tenderfoot gullibility.

The Twenty Mule Teams

Harmony as it exists today is not a terribly impressive archeological site when compared to other western mine sites and ghost towns. It does deserve attention as being the best, perhaps only, preserved site of a marsh borax operation from the era of 1870 to 1890 and for this we must thank the National Park Service. It is particularly gratifying to see the excellent results of the restoration work done by the Park Service in the winter and spring of 1999-2000.

Harmony's chief claim to fame is probably that it was the home base and starting place for the 20 mule teams on their trips to Mojave. The legend of those teams and of Harmony has been blown out of all proportion to its actual importance in the history of the west but we should accept that fact and appreciate what it has done to enhance the story of Death Valley. Without that publicity this National Park and our activities here as '49ers would probably exist on a much smaller scale, if at all.

There are many controversies about the teams. Who invented them ? Were they the first of this size ? Were there actually 20 mules, 18 mules and two horses or just 18 mules ? Did the wagons actually have 7-foot wheels ? Who built them and where ?

In this discussion it should be emphasized as strongly as possible that the people involved were very practical people who knew what they were doing, were not given to frills and excesses (except in story telling) and got the job done by doing whatever it took.

Were the twenty mule teams used at Harmony in Death Valley the first of this size? Definitely not. One does not have to look any farther than Searles Lake where John Searles had been using long line teams of 18 and 20 mules since he started borax operations in 1873. He hauled originally to San Bernardino, then eventually to Mojave and he was using the big teams before

Harmony started. At Teels marsh the Smith Brothers are reported to have been using long line teams, up to 24 mules, to haul borax 125 miles to the railhead at Wadsworth, near Fernley, before the Carson and Colorado Rail Road came to Candelaria in 1881. Harold O. Weight (see bibliography) has some very interesting comments in this regard and on page 15 of his booklet summarizes the situation as follows:

> "But if the twenty mule teams were not born in Death Valley, they were perfected there. Before, they often were a cumbersome makeshift for exceptionally heavy jobs. On the Death Valley – Mojave run they became smoothly functioning power plants with their own techniques, habits and traditions. They became ***the*** *twenty* mule teams".

Did they use 20 mule teams out of Harmony ? You can rest assured they did and that they also used 18 or 22 mules whenever the load, weather or other conditions called for those numbers; they were not bound to any definite configuration and twenty had not yet become a magic number. There is much credibility to the idea that they used 18 mules and 2 horses. Quoting Weight again:

> "The borax team usually was 18 mules, two horses. Horses were used as wheelers because they had weight to handle the wagon tongue on quick turns, not because they were smart. A dumb mule – if there is such a thing – is smarter than a smart horse."

Here again let's accept that the use of horses was not an invariable rule and that the teamsters used whatever was available and best suited their purpose.

Who built the wagons ? There seems to be no controversy about the fact that J. W. S. Perry designed them. There is some controversy about who he was. Some say he was the superintendent at Harmony but this is wrong. He was a trained pharmacist who had recently graduated and was working in a drug store in San Francisco when he met Mr. Coleman and was offered a job in charge of the borax terminal at Mojave. For their first year of operation the Harmony people contracted with Charles Bennett of Pahrump Valley to haul their borax to the railroad at either Daggett or Mojave. During this time it must have become apparent that the Carson and Colorado Railroad people had changed their minds, that the railroad was going to Bishop and not to the Colorado River via Ash Meadows and that something would have to change if Harmony was to operate profitably. Perry was given the assignment to research and design big wagons and he did an excellent job coming up with a wagon designed to carry 10 tons and which actually did carry loads over 11 tons. His design has also proven durable because, as we all know, two of the wagons were

still logging miles at our 1999 encampment after having appeared in the Pasadena Rose Parade in January.

We have been told that the wagons designed by Perry were built by a blacksmith named John Delameter in his shop in Mojave but the story seems to have originated with Delameter and there are questions. Again referring to Weight (p 12) this was because Delameter "appears to have been present, almost always in a starring role, in a great many happenings on the Mojave since 1874". Spears (p 91) says that "the wagons were built in Mojave by men working by the hour – it was not a contract job". Delameter might have been one of these men although he was in reality a teamster. The actual builders would seem to have been skilled blacksmiths and wagon makers working under Perry's supervision. Actually that would be a lot to expect from a young pharmacist but the wagons are testimony that he had exceptional talent. He later became superintendent at Harmony and when that closed became the first superintendent at Borate, the mine near Calico.

Did the wagons have seven-foot rear wheels? None of the four sets of wagons that still exist has wheels that big; they are all just under 6 feet. The seven-foot wheels were first mentioned by Spears in his 1892 book along with other wagon dimensions that have been copied by subsequent writers, apparently without question. Certainly the wagons had the smaller wheels when Spears saw them in operation at Calico in 1892. In his book he is guilty of an occasional exaggeration to make a point but would he exaggerate this? It seems doubtful. However it also seems doubtful that the larger wheels ever existed but we will probably never know for sure.

Having designed and built the wagons, Perry was assigned the job of laying out a route for them to travel and this too was done with great skill. The teams could make the 165-mile trip to Mojave in ten days, which meant there had to be nine overnight stops along the way. There were some springs where water was available but most had to be dry camps. The distances between camps had to be such that teams with loaded wagons could make them in a day considering grades and ground surfaces. Being practical men they did not want to pull the loaded water wagon anywhere they did not have to so some of the planning was to get the water wagon to a spring where it could be filled and then back to the dry camp where it was used. Hay and grain had to be hauled to each camp and left in sufficient supply for teams going both ways. At each camp there was a feed wagon, one of which is on display in the outdoor exhibits at the Borax Museum. Does the fact that there are 20 tether rings on this wagon help substantiate that there were 20 mules on each team?

There were five sets of wagons used and plant production rates would indicate that a team would have to leave Death Valley every four to five days.

This means that at least four and sometimes all five would be on the road at the same time and that teams going must often have had to share a camp with teams coming. It also means that after a team returned from Mojave to Harmony they would have three to five days to rest up, get the wagons and harness repaired, the mules shod and the wagons loaded. Harry Gower (see bibliography) says the teams stayed overnight in Mojave while the wagons were unloaded and reloaded with supplies for Harmony and the camps and that the teamsters were paid there and often spent all their money before morning. Perry must have had an extremely difficult job keeping the wagons on the road by replacing teamsters that quit or became disabled in the local saloon. They say anyone on the job over six months was an old timer. What a tremendous logistical challenge this must have been.

Much has been written about the rigors of the trip to Mojave with emphasis on the terrible heat and dryness of Death Valley. Remember that they shut down in Death Valley and hauled from Amargosa to Daggett for three months in mid-summer. This was still a pretty hot trip but it was not the Death Valley to Mojave run. The real rigors of this trip, as anyone who has been in the Mojave Desert in the winter knows, would be the wind and cold. Imagine climbing out of your bedroll, feeding yourself and the mules, harnessing them and driving 15 to 20 miles facing into a 30 to 40 mile per hour wind with the temperature in the 20s and a foot of snow on the ground. That must have happened because winter winds seem to blow constantly; freezing temperatures are common and snow not unusual in the country they traversed. Harmony and the ranch probably looked like paradise when they got back to Death Valley.

Smith Takes Over

On May 8, 1888 financial circles, particularly those on the West Coast, were stunned to hear of the collapse of William T. Coleman and Company. The problem involved an operation based on credit and the inability to liquidate assets or to obtain a replacement loan when a substantial loan came due. His borax operations were involved to the extent that he had expected to acquire some of the necessary funds through the sale of borax property to foreign interests. Unfortunately the "Mills Bill" removing protective tariffs from several commodities including borax was introduced in the U. S. Senate at this time and, although it did not pass, it caused the sale to fall through and the company to go into receivership.

By the end of 1889 arrangements had been made to satisfy most creditors by payment of 40 cents on the dollar; however, Coleman was a man of high principle and he promised to pay in full, which he did before his death in 1893. Smith had, in the meantime told J. W. Mather, his financial officer and the vice-president of Pacific Borax, that he wanted the Coleman property. Mather,

who had considerable influence in banking circles, was able to acquire the property, which Coleman valued at over $2 million, for $580,000 in 1890. This bargain included not only Harmony and Meridian Borax Companies but also a refinery in Alameda, all the Colemanite claims at Death Valley and Calico and some other less valuable borate deposits. These properties, when added to his Pacific Borax property at the Nevada locations, gave him a domination of the industry that justified the nickname "Borax" Smith.

Steven Mather

Through the years at Teels and Columbus Marshes Smith was concerned with falling prices of borax due to overproduction or, as he saw it, under consumption. To remedy this situation he hit upon the idea of introducing borax to the list of items used in the home. He instituted and pushed packaged borax sales with some rather clever, though often questionable claims. One of the smartest or most fortunate things he did was to hire Steven Mather, the son of J. W., as a part time advertising consultant.

Steven had a long association with borax through his father and had often thought that an account of the western borax industry would make interesting reading like other tales of the taming of the West. He was working for the New York Sun newspaper and one day mentioned this idea to John Spears, one of the paper's star reporters. The idea languished for a couple of years but in 1892 Spears expressed interest in the project and Steve with his father's help got Smith to appropriate some money and to send Spears west. The resulting book was designed for newsstand sales and sold for 25 cents. It was a great success and caused Smith to offer Steve the advertising consultant's job at $150 per month, less than what he made at the Sun but giving him what he considered good business connections.

Mather soon found that although Smith liked the idea of advertising he did not see the necessity of spending any money on it. Steve got around this by using his newspaper connections and planting articles on the various benefits of borax. He also composed letters to some 15 ladies' magazines extolling the virtues of borax and signed by fictitious women. During these early years he realized that Smith's borax needed something catchy to differentiate it from other brands and suggested the name 20 Mule Team Borax. Smith at first rejected the idea, saying that the packages should have his name or that of the company on them. He finally relented and the 20 Mule Teams of Death Valley became a trademark and company logo familiar to every household in the country, so familiar, in fact, that the teams have also become the de facto logo of Death Valley itself.

Spears' book and the 20 Mule Team logo were the genesis of the legend connecting borax and Death Valley. They were followed by eastern (and western) trips to world fairs and by sales trips around the country with a team and the wagons in which they traveled from town to town, stopping for a few hours at the store of anyone who would order 25 cases of 20 Mule Team Borax. All this was reinforced in later years by the very popular "Death Valley Days" radio and television shows advertising 20 Mule Team Borax and Death Valley that became mandatory listening and viewing in many American households. Ruth Woodman was the author of Death Valley Days and did an excellent job of research and writing that has contributed much to the Death Valley legends. There have been other movies with Death Valley or 20 Mule Team themes, notably one called "20 Mule Teams" starring Wallace Beery in his acting heyday.

All the above factors have helped to link borax, the 20 mule teams and Death Valley in people's minds, but Steven Mather has to be credited as being the author of the legend. He left Smith's employment to become the wealthy part owner of a successful borax company competing with Smith. He later became interested in the national parks and culminated a very successful career by becoming, in 1914, the first director of the National Park Service where he developed the organization that has been responsible for the great National Park System that exists today. We have to think that he would be particularly pleased to see the way that the borax in Death Valley legend has developed and assisted in the growth of Death Valley National Park.

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